NSF/MPS
Division of Astronomical Sciences (AST)
AAAC December 2023

R. Chris Smith, Division Director (Interim)

20 years of Liz Pentecost – an era in AST

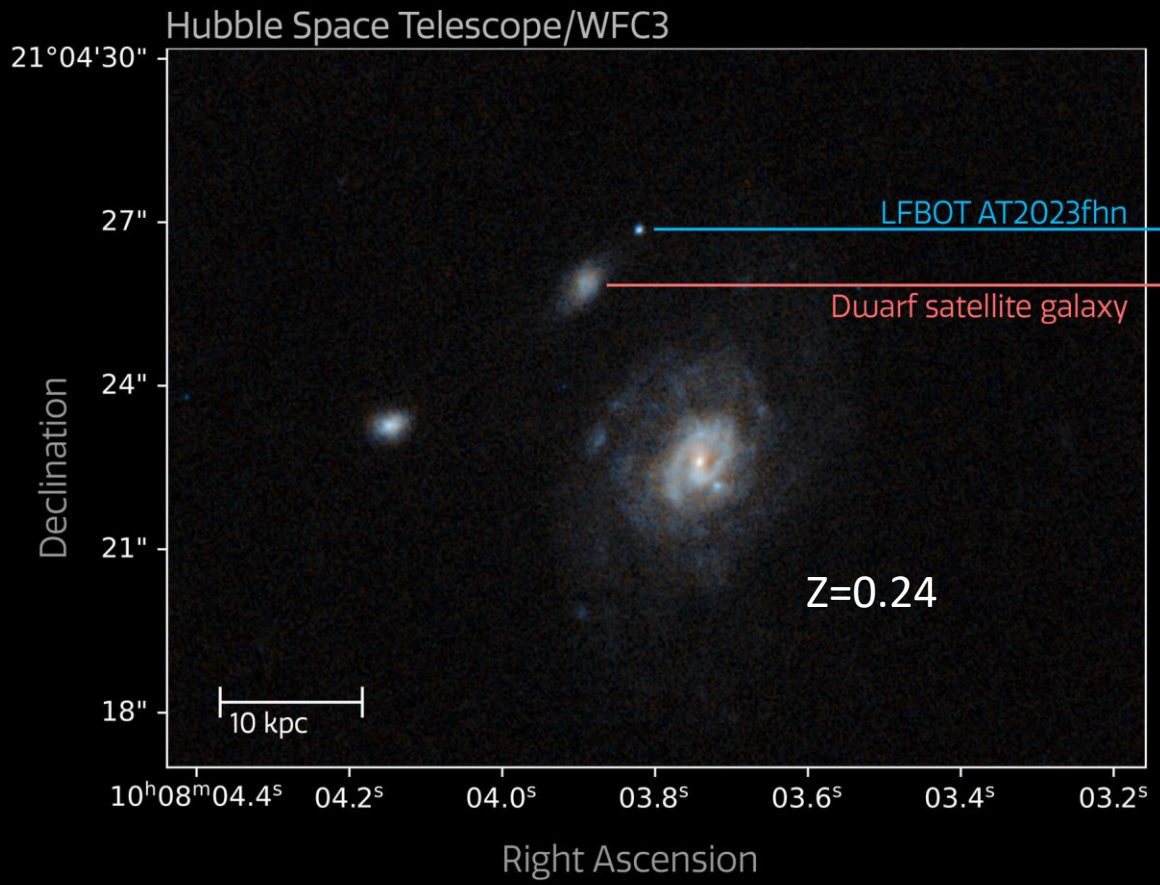
- Facilities are the cornerstone of AST
- Liz has been the cornerstone of AST Facilities **for 20 years**
- Key to finances, reviews, and oversight
- Participated in bringing **Gemini**, ALMA, DKIST, & Rubin online
- Not just AST… the U.S. astronomical community will miss you, Liz

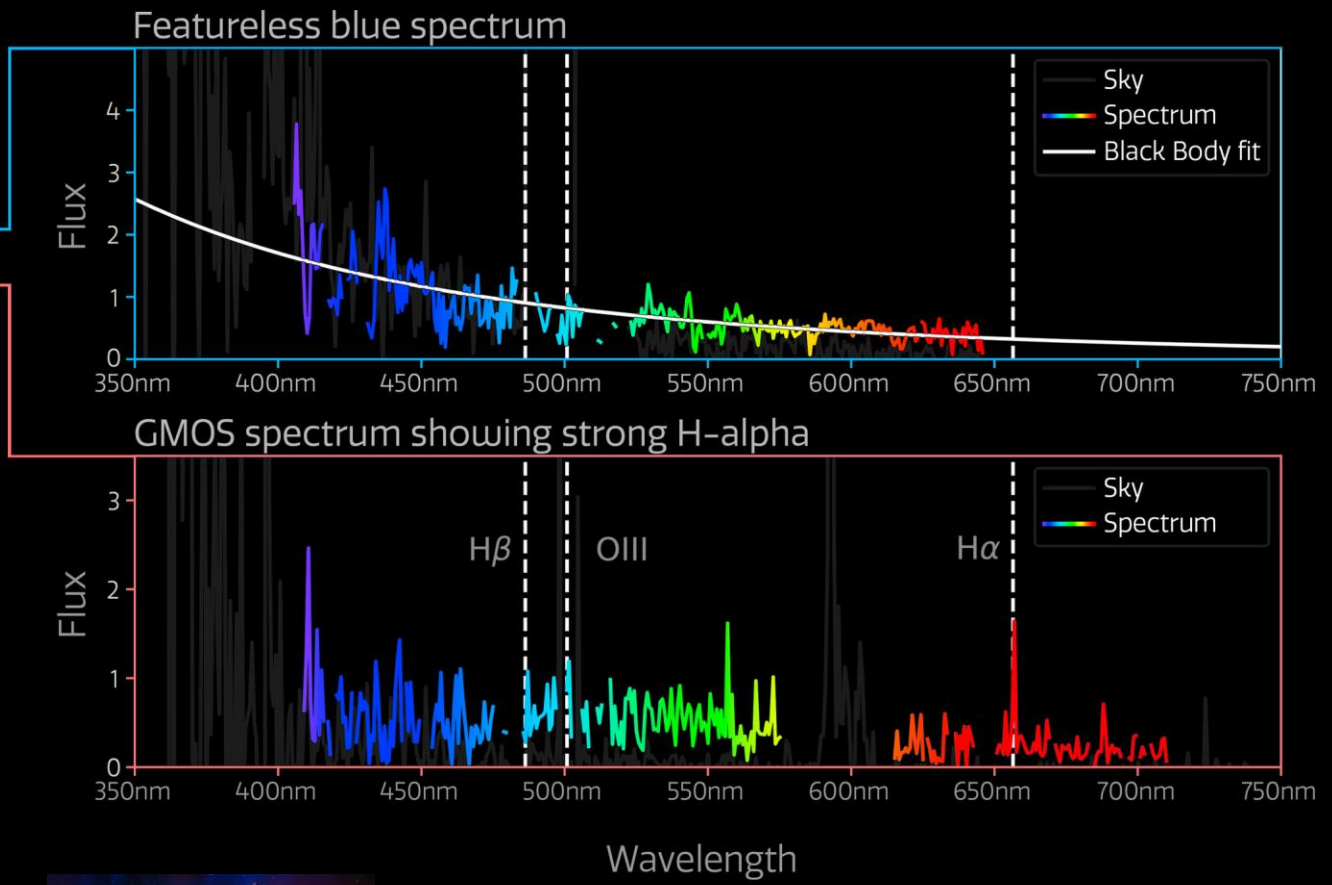
Thanks & BEST WISHES!

The Finch – A Luminous Fast Blue Optical Transient far from home

Discovered by ZFT - Spectra from Gemini/GMOS - Follow-up with HST, VLA, Chandra

Chrimes et al., https://arxiv.org/abs/2307.01771





The "Finch" lies > 3.5 half-light radii from its host galaxy – a first for Luminous Fast Blue Optical Transients

How does a massive core-collapse object get 16 Kpc from its host in less than 100 Myr?

Multi-messenger Ecosystem: Report coming out soon!

https://noirlab.edu/science/events/websites/MMA2023

UPDATE: AI for Astronomical Sciences

- Awards anticipated in FY2024
- Proposal Deadlines
  - ~~Preliminary: Oct 31, 2023~~
  - Full proposal: Feb 16, 2024
- Expecting to fund 2 Awards: $16-20M each for 4-5yrs
- Funded in collaboration with Simons Foundation

← Search for more funding opportunities

Important information for proposers
All proposals must be submitted in accordance with the requirements specified in this funding opportunity and in the NSF Proposal & Award Policies & Procedures Guide (PAPPG) that is in effect...

Supports the development of new AI Institutes that focus on one of the following themes: astronomical sciences, materials research and new methods for strengthening AI.

PEOPLE: Workforce Development

		Description
AST	**PAARE**	AST: Partnerships in Astronomy & Astrophysics Research and Education
AST	**REU**	AST: Research Experience for Undergraduates
AST	**AAPF**	Astronomy & Astrophysics Postdoctoral Fellows
MPS	**ASCEND**	MPS: postdocs with potential to broaden participation
MPS	**LEAPS**	MPS: early career faculty at institutions with little NSF STEM funding
NSF	**GRFP**	NSF: Graduate Student Research Fellowships Program
NSF	**CAREER**	NSF: faculty early career development for leadership
NSF	**GRANTED**	NSF: Growing Research Access

Main AST/MPS/NSF programs devoted to training a diverse workforce and enhancing early careers.

Expanded PAARE

- Encouraging new partnerships, expanding opportunity to a wider range of institutions
- Fully developed partnership concepts funded up to 5 years
- Shorter term proposals (1 to 2 years) available to develop new partnerships

- **Solicitation out TODAY!**
- **DEADLINE: March 12, 2024**

← Search for more funding opportunities

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Synopsis

The objective of PAARE is to improve the quality and environment of astronomy and astrophysics research and education by stimulating the development of formal, long-term partnerships that provide authentic pathways into the research enterprise and broaden participation in astronomy by encouraging proposals from the full spectrum of talent across society to include individuals from groups that have been historically underrepresented. Partnerships must substantially involve institutions seeking to create opportunities for student and faculty research that will increase the recruitment, retention, and success of these individuals. It is expected that the partnerships will build or strengthen research capacity, as well as foster a diverse, inclusive, and equitable environment for astronomy and astrophysics research and education at the partnering institutions.

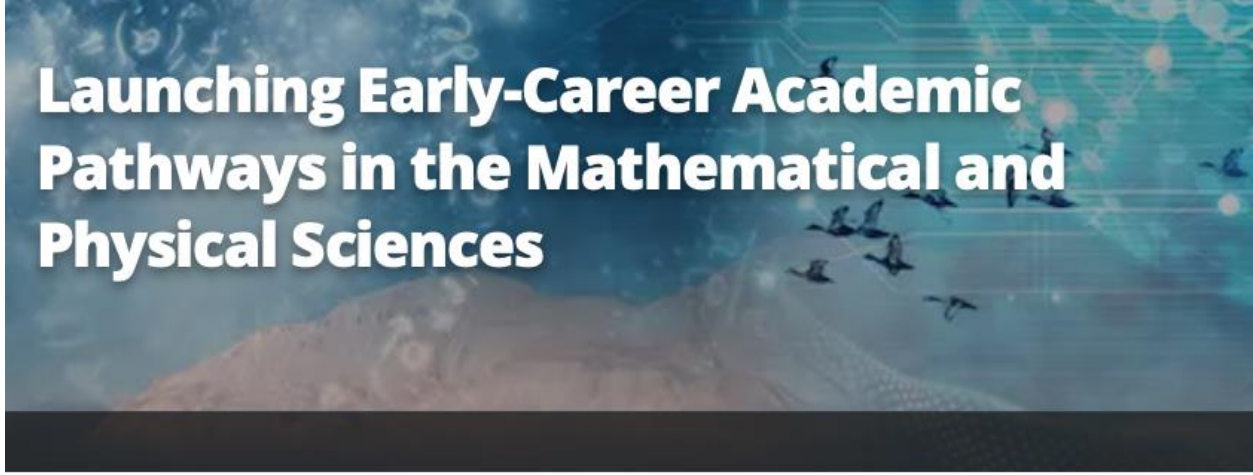
https://new.nsf.gov/funding/opportunities/partnerships-astronomy-astrophysics-research

LEAPS-MPS

- Support for pre-tenure faculty
- Meant to be a springboard to launch research careers
- 24 months
- Up to $250,000 total costs

- **DEADLINE: January 25, 2024**

https://new.nsf.gov/funding/opportunities/launching-early-career-academic-pathways



← Search for more funding opportunities

Important information for proposers
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Supports the research of pre-tenure faculty in mathematical and physical sciences, with an emphasis on those at institutions that traditionally do not receive significant NSF funding, such as minority-serving, predominantly undergraduate or R2 institutions.

Synopsis

The Launching Early-Career Academic Pathways in the Mathematical and Physical Sciences (LEAPS-MPS) call has an emphasis to help launch the careers of pre-tenure faculty in Mathematical and Physical Sciences (MPS) fields at institutions that do not traditionally receive significant amounts of NSF-MPS funding, such as some minority-serving institutions (MSIs), predominantly undergraduate institutions (PUIs), and Carnegie Research 2 (R2) universities. LEAPS-MPS has the additional goal of achieving excellence through diversity and aims to broaden participation to include members from groups historically excluded and currently underrepresented in the Mathematical and Physical Sciences, including Blacks and African Americans, Hispanics, Latinos, Native Americans, Alaska Natives, Native Hawaiians, and other Native Pacific Islanders.

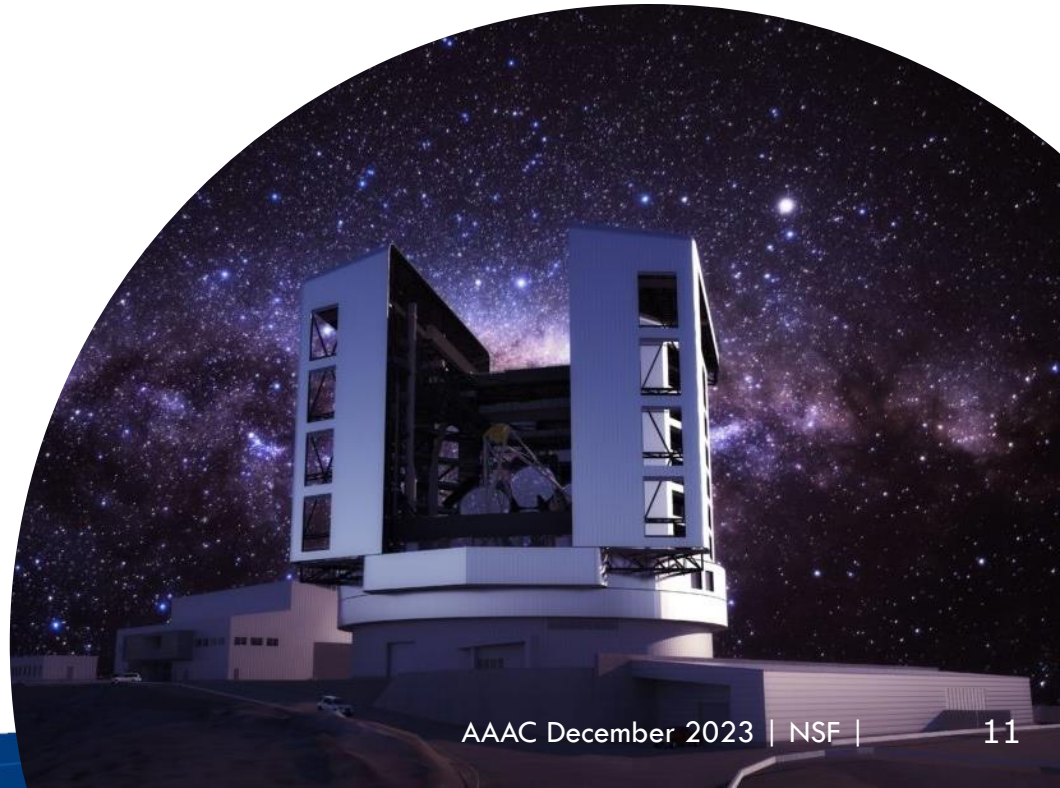
Spectrum Group: World Radio Conference 20 Nov – 15 Dec 2023, Dubai

- Strong representation by NSF, NASA, NOAA
- "Most 'pro-science' in at least a decade…"
- Instructions for improved coordination between satellite operators and radio astronomers
- Space weather defined; on 2027 agenda
- Other 2027 conference items!

Astro2020 & Major Facilities Recommendations

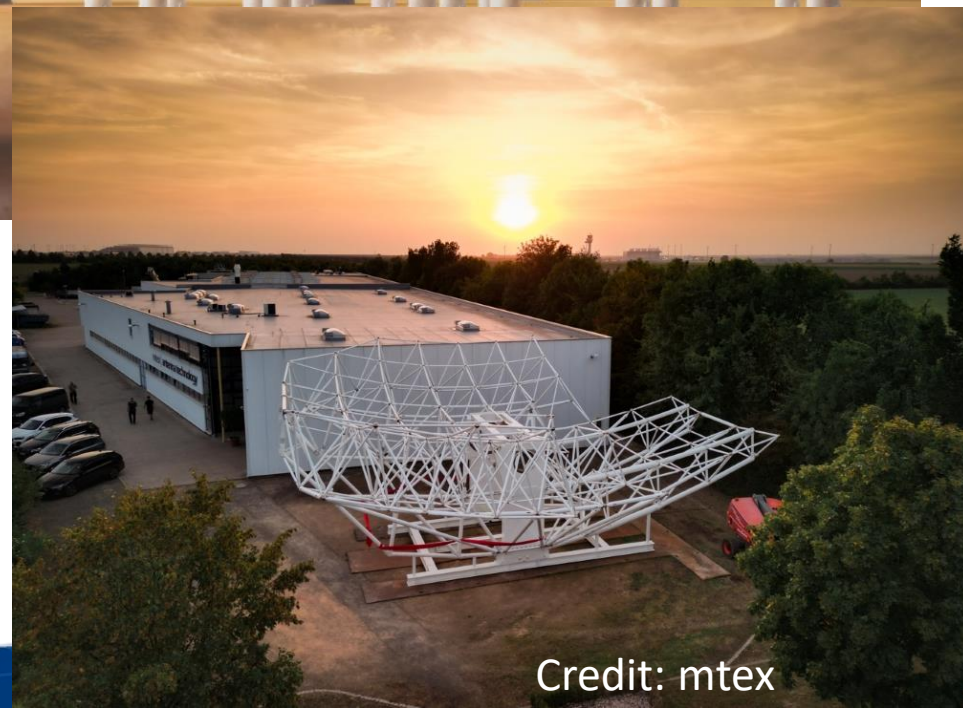
US-ELT Program

- NSF formally started the TMT environmental review process (Aug 2022)
- US-ELT entered NSF's Major Facility Design Stage in Preliminary Design (Dec 2022)
- TMT and GMT both successfully completed NSF's PDR (Feb 2023)
- MPS Blue Ribbon Panel supported AST plan for moving projects forward (Jun 2023)
- **MPS+AST took projects to Facilities Readiness Panel requesting entry into Final Design (Oct 2023); decision pending**



ngVLA

- ngVLA project entered NSF's Major Facility Design Stage (in Conceptual Design Phase) in July 2023
- NRAO design and development program office funded for FY23+FY24
- **Informational Presentation to NSB in November 2023**



Credit: mtex

Work on antenna prototype progressing –rollout event in Germany in September 2023

CMB-S4

- Moving project toward entry into NSF's Major Facility Design Stage, Conceptual Design
  - *Development funding provided in FY23*
- Team developing alternative possible designs with different infrastructure footprints at South Pole (in response to OPP DCL: https://www.nsf.gov/pubs/2022/nsf22078/nsf22078.jsp)
- Both short-term and long-term planning for South Pole activities still evolving, impacting potential plans for CMB-S4

Future MREFC Candidates: MPS Facilities on the Horizon?

- AST: Astro2020
  - Several Major Facility recommendations critical to advances in the field and U.S. Leadership: US ELT Program, CMB-S4, ngVLA
- PHY: Astro2020, and now P5 !
  - Astro2020: What is next in Gravitational Wave observations?
    - Cosmic Explorer “Horizon Study”, ngLIGO
    - AC Subcommittee on next-generation facility concepts
  - Astro2020 & P5: IceCube Gen 2?
- DMR: What is next in high magnetic field instrumentation?
  - National Academies Study underway; recommendations for Next-gen High-field Magnets
  - Potential alignment with TIP

Community Vision Requires Prioritization

MPS Advisory Committee (AC) Subcommittee on Facilities and Major Research Infrastructure
Long term (5-yr) Charge

- **Assess potential contributions of new Major and Mid-scale infrastructure projects in the context of the MPS portfolio**
- Provide recommendations for (required) MPSAC endorsements of Major Facility projects
- Provide strategic advice on elements of, and the balance of, the evolving MPS research infrastructure portfolio, including Major Facilities and Mid-scale investments
- **Provide guidance on the structure for decisions that will lead to a robust 10-year program of strategic investments in the development, construction, operations, and divestment of MPS major research infrastructure**

Study 1: Establish Critical Need

- Provide a summary for MPSAC consideration articulating the importance of major and mid-scale facilities to NSF's scientific leadership and MPS's role in ensuring that its scientific research infrastructure enables the current and future cutting-edge science of the Directorate.
- Report 1:
  - ***The science and technology that will define our future, and power our economy, will only flourish in the U.S. if we sustain a strong scientific ecosystem that includes leading-edge research instruments.***

Study 2: Prioritization of NEW Major Facility Projects

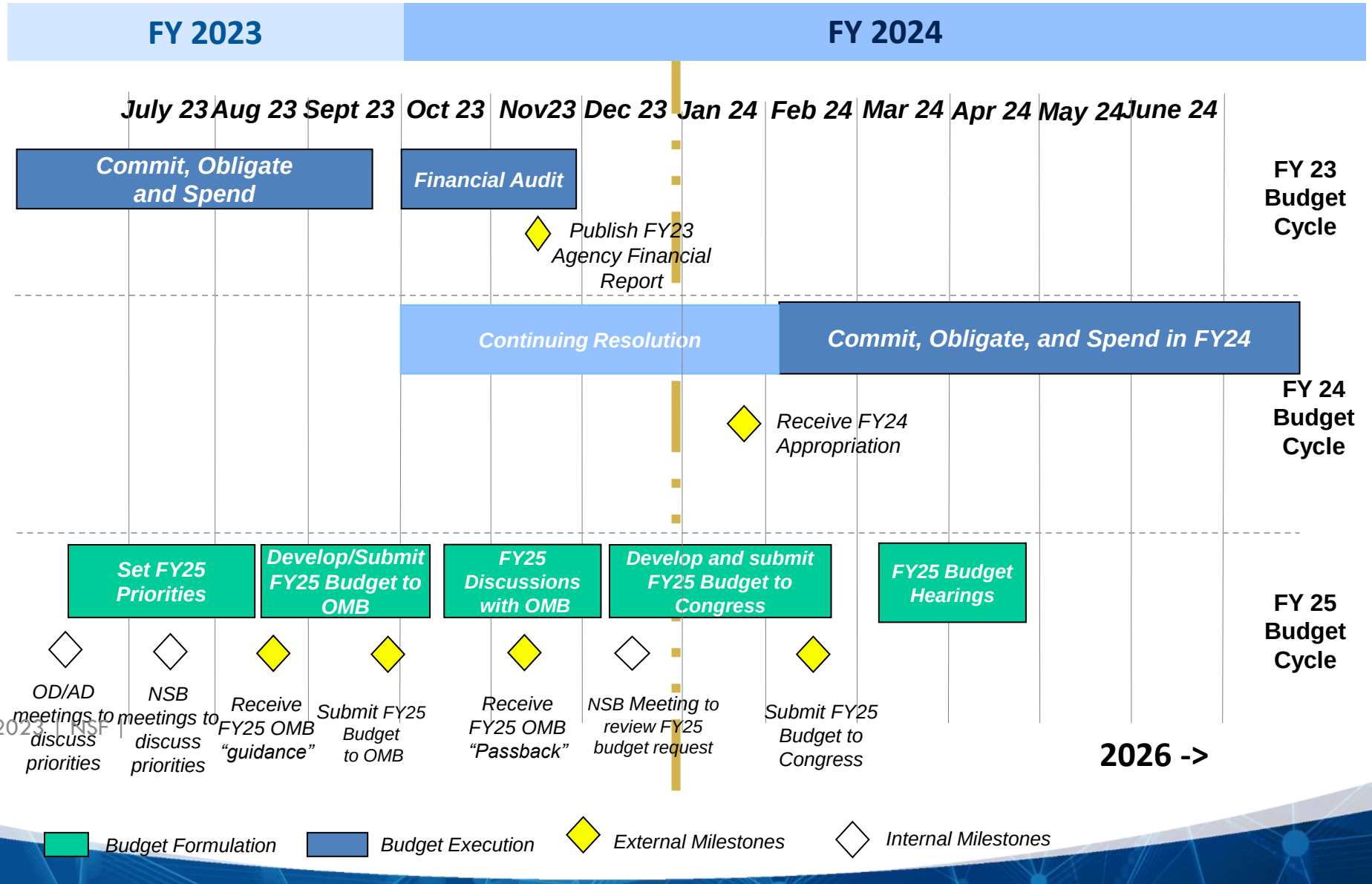
Report 2 posted TODAY!

- **Provide to MPS a set of considerations for prioritization of major facility projects across the competing needs of the communities served by the Directorate that incorporate the financial and societal realities of the scientific enterprise in the 2020s and the current and future needs of MPS communities, in order to ensure a vibrant infrastructure portfolio that delivers the scientific mission of MPS, specifically, and NSF, overall.**
- **Including**
  - **Multi-level strategic considerations (Directorate, Agency, Federal priorities)**
  - **Partnerships and discipline context**
  - **Current investments in new facilities vs future investments**
  - **Societal realities; holistic view of broader impacts and broadening participation**
  - **Balance of risk and reward**

https://www.nsf.gov/mps/advisory/facilities.jsp

NSF/MPS/AST Budgets

Typical NSF Budget Activity Timeline - Update



FY24 NSF Realities

- FY23 enacted = $9.87B
- FY24 President's Request = $11.31B
- FY24 House mark = $9.63B
- FY24 Senate mark = $9.50B
- FY24 Conference/Appropriation = ?

AST Challenge: Balancing needs

- Immediate need = Facilities Design & Development, with help from MPS+OD
- Plan for construction = MREFC Funding (not AST, but NSF-wide prioritization)
- Future need = Managing growing Facilities operations costs of existing facilities while bringing new facilities online

Facilities focused

AST Challenge: Aspirational planning, but Execution within Allocations

- Strategic planning: plan for best case
  - Research Infrastructure prioritization alongside modest growth in “base” for grants
  - Still need to understand/resolve operations costs!

- Strategic planning: prepare for difficult decisions
  - Phasing projects, balancing needs, prioritizing funding lines

Facilities focused

Homework: Advice?

- Astro2020 included many recommendations; some with decision criteria
  - Increases in grants
  - Midscale investments
  - New large facilities

In a funding constrained environment

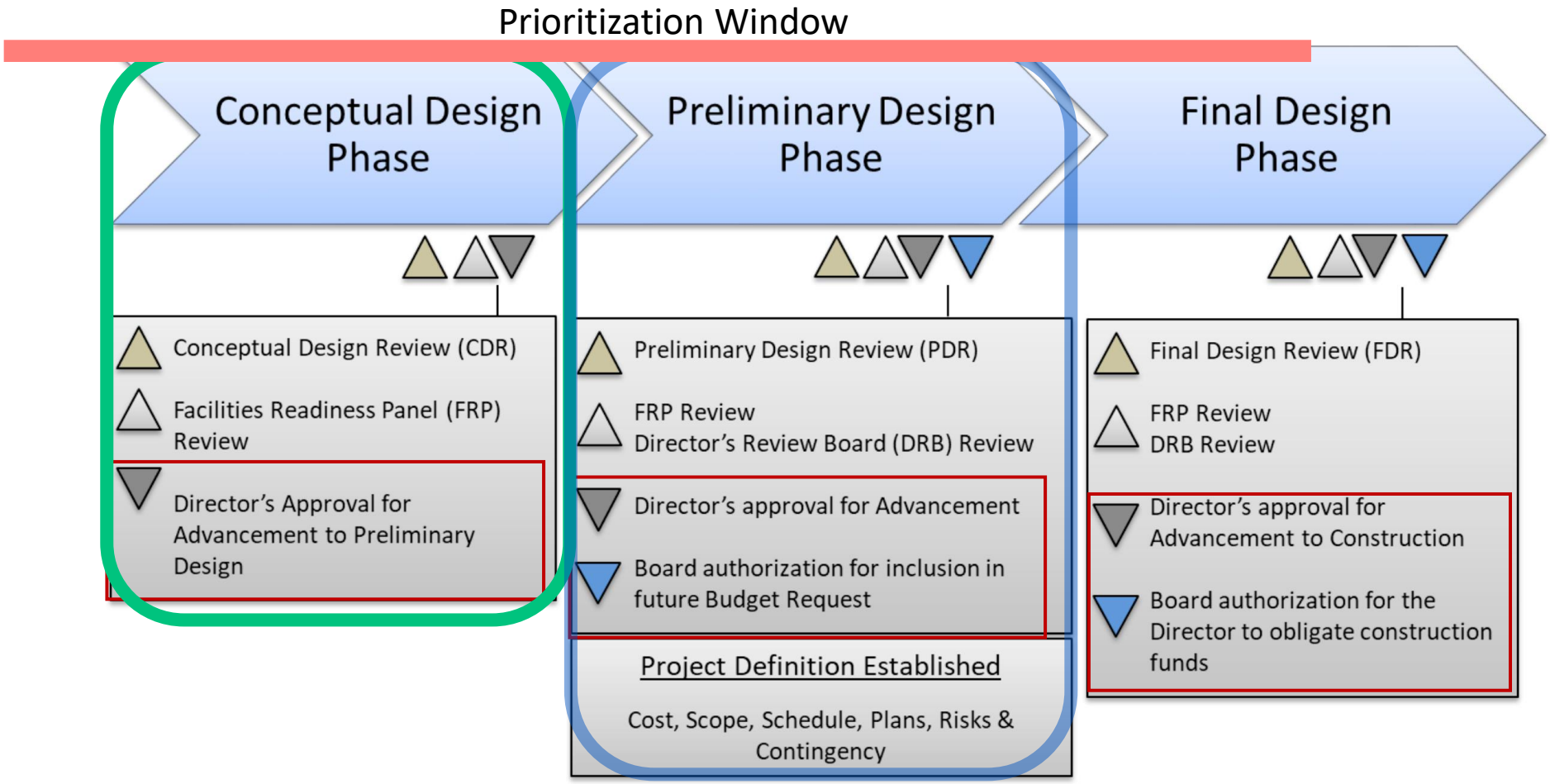
- What **criteria/considerations** might YOU use to prioritize the recommendations of Astro2020 across the different areas?


NSF

Facilities Lifecycle Context

Source: NSF Major Facilities Guide (Sep. 2019), Figure 2.1.3-1.

NSF's Major Facilities Design Stage



- Projects can enter at any point before PDR
- **Entry into Design Stage does NOT imply commitment to fund construction**

Source: NSF Major Facilities Guide (Sep. 2019), Figure 2.1.3-2.